

# INTEGRATED PEST MANAGEMENT DEMONSTRATION PROJECT in LOUISIANA and TEXAS PUBLIC SCHOOLS

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**Abstract** The purpose of this demonstration project was to evaluate the effectiveness of three integrated pest management (IPM) treatment plans in controlling structural and institutional pests in public schools. IPM strategies evaluated were: 1) exclusion, trapping, and sanitation, with no chemical inputs; 2) exclusion, trapping, sanitation with rodent and/or insecticide baits; and 3) use of options 1 and 2 with the addition of contact and residual pesticides labeled for use in public schools. Eighteen schools, nine each in Texas and Louisiana, were used and they were separated geographically in order to represent the climate and pests in each state. Schools within each geographic area were randomly selected to follow one of the three IPM treatment plans. Action thresholds for pests were used to make decisions on treatment options, and when to elevate to the next level of treatment(s). Monitoring with glue boards and visual inspections identified pest levels or pests of health and safety concerns. Due to repeated failures of IPM treatment plans 1 and 2 to control pest populations, all schools exceeded action thresholds triggering IPM treatment plan 3 before the demonstration was concluded. Undue limitations on the use of pesticides within public schools places the children, staff, and structures at risk from pest problems.

**Key Words** IPM schools children arthropods pesticides

## INTRODUCTION

Studies indicate that children are more susceptible to pesticide poisoning than are adults (National Research Council, 1993). Even when used according to label directions, there is a potential, although limited, for children to be exposed to pesticide residues within public schools (U.S. General Accounting Office, 1999). In 1991, based on a growing concern over pesticide use in schools, the Texas Legislature amended the Texas Structural Pest Control Act to require that all public schools within the state develop and implement IPM plans. In 1995, a similar requirement was adopted in Louisiana. Although several guides are available on school IPM (Integrated Pest Management for Schools: A How-To Manual, EPA Region 9; IPM Workbook for New York State Schools, Cornell Coop. Ext. Service; and School IPM-Technical Information, Univ. of Florida), there is limited information available on the effect IPM has had on controlling pest populations within schools. There has been no clear evaluation of the contribution that pesticides make within these programs. The debate over the use of pesticide dusts and sprays within public schools has become even more focused with the development of newer insecticidal bait products. In contrast, the effectiveness of traps, exclusion, and sanitation in controlling existing populations of structural pests has been widely reported (Beyond Pesticides, NCAMP, 2000-2001).

The schools selected in Louisiana and Texas represented the different geographical, climatic, student population, and economic conditions that exist throughout each state. Within each state, nine schools, a total of eighteen, were selected to participate in the demonstration project. Within each state schools were then selected to receive one of three possible IPM treatments.

In Louisiana three schools were selected from each of Rapides Parish, Richland Parish, and St. Landry Parish. The schools selected from Rapides Parish included Arthur F. Smith Junior High School, Cherokee Elementary School, and Peabody Magnet High School. The enrollment for these schools included 613, 522, and 753 students and covered 25, 25, and 30 square miles, respectively. Richland Parish included Delhi Elementary School, Holly Ridge Elementary, and Rayville High School and Junior (shared campus). The schools had enrollments of 200, 198, and 791 students and pulled from 125, 10, and 25 square miles, respectively. In St. Landry Parish the schools were Creswell Elementary, North Elementary (Opelousas, La.) and Opelousas Junior High School. The three schools had enrollments of 282, 44, and 560 students, respectively, and served a combined area of 45 square miles.

In Texas the independent school districts participating in this project were Bastrop (Bastrop Intermediate School, Bastrop Middle School, and Emile Elementary School), Ector County (Blanton Elementary School, Murry Fly Elementary School, and Noel Elementary School), and Houston (Herrera Elementary School, Janowski Elementary School, and Lyons Elementary School).

Houston Independent School District (ISD) is the largest public school system in Texas and seventh in the United States. The district operates 295 campuses and educational programs with an enrollment of more than 208,000 students drawn from a 808-square km area. Bastrop ISD draws students from the City of Bastrop, several smaller communities, and the surrounding rural area within the school district's boundary that encompasses an area of 1165 square km. The district operates 11 schools with an enrollment of more than 6,400 students. Ector County ISD draws students from the City of Odessa and surrounding rural area. In 2000, the district operated 41 schools with an enrollment of more than 27,000 students.

The conditions experienced in all of the participating schools were typical of those faced by many schools and provide a realistic test of IPM strategies. The results from this project can be used as a guide for school administrators, pest management professionals, and parent groups to assist in limiting the exposure to pesticides, while using the most effective IPM control plan that protects children, staff, and personnel from pests.

## METHODOLOGY

The cooperation of the eighteen participating schools (three in each of three districts or parishes) in both Louisiana and Texas was obtained for a demonstration of the effects of IPM practices. The list of participating schools and the IPM treatment assigned to each is contained in Table 1.

Pests were identified as animals, insects, and spiders that interfere with the use of the school site. Strategies for managing pest populations were influenced by the pest species and whether that species posed a threat to the people, property, or the environment. Pest problems located in the exterior turf or ornamental areas were ignored.

Pest levels and other factors, such as sanitation and repairs, were monitored through inspections conducted at regular intervals. Pest infestation action thresholds were established for triggering the IPM measures (Table 2). The first step in each of the three IPM plans was to track down infestations, review sanitation procedures, remove clutter, open equipment, check inaccessible areas, vacuum, and otherwise clean rooms as appropriate. Following this action, if a pest(s) exceeded the action level, specified application of control measures as directed under IPM treatment plans 1, 2, or 3 was implemented. No IPM strategy or treatment was partially implemented or applied in stages. Repeated failure of IPM treatment plans 1 or 2 to control or reduce an infestation below that specified by the action threshold would result in the abandonment of that treatment plan and move to IPM treatment plan 3.

Table 1. Public Schools participating in the IPM demonstration project and the treatment assigned to each

Treatment:	1	2	3
	Exclusion, trapping, and sanitation only; no outside perimeter treatment with pesticides	Exclusion, trapping, sanitation, and pesticide baits; outside perimeter treatment limited to baits	Exclusion, trapping, sanitation, and the use of pesticide baits, dusts, and residual sprays
<b>Louisiana</b>			
Rapides Parish	Cherokee Elementary School	Arthur F. Smith Junior High School	Peabody Magnet High School
Richland Parish	Delhi Elementary School	Holly Ridge Elementary School	Rayville High School and Junior High School
St. Landry Parish	Creswell Elementary School	North Elementary School	Opelousas Junior High School
<b>Texas</b>			
Bastrop ISD	Emile Elementary School	Bastrop Intermediate School	Bastrop Middle School
Ector County ISD	Noel Elementary School	Blanton Elementary School	Murry Fly Elementary School
Houston ISD	Herrera Elementary School	Janowski Elementary School	Lyons Elementary School

Table 2. Action thresholds for common pests

Pest	Location	Threshold Number
Ants (common house-infesting)	Classrooms and other public areas	2 ants/room
	Infirmary	1 ant/room
	Kitchen/Cafeteria	2 ants/room
	Maintenance and storage areas	3 ants/100 square feet in two successive monitoring periods
	All Indoor Areas listed above	Feeding trail or twice threshold number for type of room in two successive monitoring periods Treatment 2: apply baits Treatment 3: apply baits and other insecticides as necessary
	Outside grounds	Ant mound within 10 feet of building Treatment 2: apply baits Treatment 3: apply baits and other insecticides as necessary*

\* on school grounds with a documented history or high probability of ant problems from species that collect honeydew and honeydew-producing insects on shrubs or other ornamental plantings adjacent to buildings, an annual application of a systemic insecticide to control sucking insects may be performed in Treatment 3.

Table 2, continued —

Table 2. Action thresholds for common pests, *continued*

Pest	Location	Threshold Number
Red Imported Fire Ant	Indoors	1/room 2/room Treatment 2: may apply baits Treatment 3 may apply baits and other insecticides as necessary
	Outdoors	No treatment within 100 feet of buildings unless mounds are present or number of foraging ants present a danger to students** Any red imported fire ant mound(s): Treatment 1: apply boiling water to mounds Treatment 2: apply baits Treatment 3: apply baits and other insecticides as necessary**
Ants (carpenter)	Classrooms, public areas, 2 ants/room maintenance areas	
	Infirmary	1 ant/room
	Kitchen/Cafeteria	2 ants/room
	All Indoor Areas listed above	Feeding trail or twice threshold number for type of room in two successive monitoring periods Treatment 2 apply baits Treatment 3 apply baits and other insecticides as necessary
	Indoors/Outdoors	ant colony suspected inside or within 25 feet of any building Treatment 2 apply baits Treatment 3 apply baits and other insecticides as necessary***
Bees (honey, bumble) Paper Wasps Yellow Jackets	Classrooms, infirmary, kitchen, cafeteria, and public areas	1 bee, wasp or yellow jacket Treatment 3 Insecticide sprays as last resort
	Maintenance areas	3 bees, wasps or yellow jackets Treatment 3: Insecticide sprays as last resort
	Outdoors	No action unless children are threatened; All treatments may use soap and water for honey bee swarmers Treatment 3: Insecticide sprays or dusts may be used if there is a threat to children
	Trash can or dumpster	10/10 minutes Treatment 3: insecticide sprays or dusts may be used if there is a threat to children

\* On school grounds with a documented history or high probability of ant problems from fire ants and honeydew-producing insects on shrubs or other ornamental plantings adjacent to buildings, an annual application of a systemic insecticide to control sucking insects may be performed in Treatment 3.

\*\*Bait treatment followed by individual mound treatment such as the Texas Agricultural Extension Service’s “Texas Two-Step Program” recommended for moderate to heavy infestations.

\*\*\*On school grounds with a documented history or high probability of ant problems from carpenter ants and honeydew-producing insects on shrubs or other ornamental plantings adjacent to buildings, an annual application of a systemic insecticide to control sucking insects may be performed in Treatment 3.

Table 2, continued —

Table 2. Action thresholds for common pests, *continued*

Pest	Location	Threshold Number
Black Widow or Brown Recluse Spiders, Scorpions	Any indoor area	Take immediate action if suspected
		Treatment 3: apply pesticide if 2 or more found in 7-day period
Other Spiders	Classrooms, infirmary, kitchen/cafeteria	1/room Treatment 2: May apply pesticide if 2 or more found in 7-day period
	Hallways, maintenance, and unoccupied areas	3/room Treatment 3: May apply pesticide if 2 or more found in 7-day period
	Outdoors	Only if in large numbers or causing problems Treatment 3: apply pesticide sprays or dusts
Silverfish	Library and wherever books, paper, files are stored	1/room Treatment 2: 3/room use baits Treatment 3: 3/room apply baits and other insecticides as necessary
	Other indoor areas	2/room Treatment 2: 5/room use baits Treatment 3: 5/room apply baits and other insecticides as necessary
Cockroaches	Classrooms and other public areas	2/room Treatments 2 & 3: if 3 cockroaches per room, apply cockroach bait. Treatment 3: if 3 or more, apply baits and other insecticides as necessary.
	Infirmary, kitchen	1/room Treatments 2 & 3: if 3 cockroaches per room, apply cockroach bait. Treatment 3: if 3 or more, apply baits and other insecticides as necessary
	maintenance areas	5/room Treatments 2 & 3: if 3 cockroaches per room, apply cockroach bait Treatment 3: if 3 or more, apply baits and other insecticides as necessary
Crickets Miscellaneous Invaders	Classrooms and other public areas	2/room
		2/room Treatments 2 & 3: may apply baits
		2/room Treatment 3: may apply baits and other insecticides as necessary
	Infirmary, kitchen, cafeteria	2/room 2/room Treatment 2: may apply baits Treatment 3: may apply baits and other insecticides as necessary.
Maintenance areas	3/room	Treatment 2: may apply baits Treatment 3: may apply baits and other insecticides as necessary
	outside grounds	no action unless causing invasion problems Treatment 2: apply baits Treatment 3 apply baits and other insecticides as necessary

*Table 2, continued—*

Table 2. Action thresholds for common pests, *continued*

Pest	Location	Threshold Number
Grain and Flour Pests	Found in food for human consumption, kitchen, food storage area	1/package or container 5/room, Treatment 3: may apply insecticides as necessary
	Pet food, classroom supplies	1 if escaping from packaging
	Classrooms	5/room Treatment 3: may apply insecticides as necessary
	in pheromone traps:	2 of any one species (total of all traps in room) Treatment 3: may apply insecticides as necessary
House Flies	Classrooms and other public areas	3/room 6/room, Treatment 3: may apply insecticides as necessary
	infirmary; kitchen	1/room 5/room, Treatment 3: may apply insecticides as necessary
	maintenance areas	5/room 10/room, Treatment 3: may apply insecticides as necessary
	outside grounds	5 flies around any one trash can or 10 flies around a dumpster – use sanitation If 5 flies around any one trash can or 10 flies around a dumpster are still found after sanitation: Treatment 2: apply baits Treatment 3: apply baits and other insecticides as necessary
Mice, Rats	Indoors	any mouse sighting or evidence of mice (such as new mouse droppings, tracks, etc.) triggers pest management action Treatments 2 & 3: Rodent baits may be used only if other methods fail to eliminate problem in 14 days
	outdoors	any noticeable burrows or activity in student areas Treatments 2 & 3: Rodent baits may be used only if other methods fail to eliminate problem in 14 days or if chronic immigration problem
Other Pests not listed		Indoors/Outdoors Treat in manner for similar listed pests

**Glue Board Surveys**

A monitoring program, using glue boards, using Trapper LTD Glue Traps (Bell Laboratories, Inc), was conducted in all demonstration project school facilities. The purpose of monitoring with glue boards was to provide a standardized assessment and data on the occurrence of pests at set intervals of the project. The survey was conducted by a member of the state agency, a pest management company, or a qualified school employee. Glue boards were set and monitored for a minimum 48-hour period at the start of the study and every 25-35 days thereafter. An additional month of sampling data was collected in the Bastrop ISD schools. In Ector County ISD glue board monitors were left in place for 60 hours due to staff schedules. Data from the glue boards used for control were also collected.

Glue boards were placed in four classrooms in each school facility. Preference was to be given to classrooms where food was allowed and with or near exterior doors but otherwise representative of the school facility. Additionally, one each of the following locations (if in the facility and available for monitoring) was be monitored with glue boards: kitchen, cafeteria, teacher

lounge, office, custodial closets, storage closets, book room, electrical and mechanical room, restroom and locker room, infirmary and nurse's room, library.

Glue boards were placed on the horizontal floor surface against a wall and within one foot of a corner. For closets and storage rooms of less than 9 sq. meters, two glue boards were placed in areas expected to be most likely to capture pests if present. For larger rooms, up to 74 sq. meters, a minimum of four glue boards, at or near each corner of the room, were used. For larger rooms, an additional glue board was used for each additional 18 sq. meters or fraction thereof, located along a wall or other suitable location. In rooms with accessible false or drop ceilings less than 3 meters from the floor, glue boards equivalent to the number used in the room were placed in the ceiling void to the extent possible. Most monitoring was conducted from after school on Friday afternoon to the following Sunday afternoon. In Ector County schools in Texas, and in all of the Louisiana schools, glue boards were retrieved on the following Monday morning due to limitations on school access. An attempt was made to place all monitoring stations in areas where children could not locate them if present, or placement was made during periods when students were not expected to be present. Monitoring stations were placed in classrooms on a temporary basis only. The teachers and other school personnel present during periods when glue boards were being placed were made aware of the monitoring station locations, when they would be inspected, when they would be removed, and the purpose for placement. Rooms were monitored a minimum of once per month at roughly 30-day intervals, and all significant activity documented.

### **Sanitation Inspection**

Sanitation inspections were conducted at the initiation of the project and monthly thereafter. These inspections were in conjunction with the glue board monitoring previously described. The initial inspection was conducted by a state agency employee or a state agency employee in conjunction with a pest control company employee(s) or qualified school employee(s). Subsequent inspections were conducted by either the state agency employee, pest control employee, or school employee during the glue board monitoring.

### **Kitchens and Cafeterias, Custodial Services, Maintenance**

All food service facilities were maintained in accordance with state food and drug regulations. Food service personnel were to assist by properly maintaining food preparation and storage areas and reporting signs of pest activity or infestation.

All school buildings were cleaned and maintained in a sanitary manner, and all building custodial staff knowledgeable of the fundamentals of safety and sanitation for their areas of responsibility. The custodial staff assisted by reporting any signs of pest activity or infestation. All school buildings and grounds were maintained in a manner that is consistent with acceptable standards. Facilities were continuously evaluated and scheduled for repairs and renovations so that health, safety, and pest exclusion concerns are addressed in a timely manner.

### **Pesticide Application**

Only personnel meeting state requirements for certification, licensing, or supervision were allowed to make any pesticide application. Pesticides were not used in facilities subject to IPM treatment plan 1 unless emergency conditions, legal requirements, or unacceptable levels of pest infestation dictated otherwise. Failure to meet health department standards would dictate use of pesticides in some areas of the facilities scheduled for IPM treatment plan 1. Any and all such occurrences were documented.

Under pest control treatments 2 and 3, pesticides applications could be used only after pests exceeded a designated threshold level or there was an immediate threat to the health and safety of

the students, teachers, or school personnel that could be best addressed through a pesticide application(s). When it was determined that a pesticide must be used in order to meet important pest management goals, the least hazardous material and method of application was chosen. Re-entry intervals as specified on the product label or by state law or regulation, whichever is longer, were observed.

Products for use in the demonstration project were selected to provide an array of control options and to combat pests commonly found to be infesting school facilities. Only those products listed were used in order to assure some consistency between sites in the products used. An array of chemistries were made available so that pest managers could use IPM techniques to avoid pesticide resistance. Also, consistent with IPM practices, a large number of baits were listed to meet seasonal food shifts as well as population and individual feeding preferences of pests. Emergency treatments were permitted in the area of localized infestation when a threat to health or property was imminent. Records of the reasons for emergency treatments were maintained.

### **Re-evaluation**

The school districts, in cooperation with the demonstration project participants, were required to make a re-evaluation of all school facilities and pest management practices before abandoning any of the pest management strategies. Discontinuation of IPM treatment plans 1 and 2 would be called for in any school, prior to the end of the study period, if sanitation and exclusion alone, or when combined with limited bait applications, continually failed to suppress or control pest populations below those specified by the action thresholds.

## **RESULTS and DISCUSSION**

School schedules, level of cooperation, availability of pest control personnel, use of schools by community groups, weather, and a priority of school repair and sanitation needs significantly impacted the School IPM Demonstration Project. However, the aforementioned factors represent the real-world conditions found in our public schools and provide a true and fair evaluation of the IPM program.

### **IPM Plan 1**

The schools receiving IPM treatment plan 1 (Cherokee Elementary, Delhi Elementary, Creswell Elementary, Emile Elementary, Noel Elementary, and Herrera Elementary) — sanitation and exclusion — had limited, short-term control of the pests encountered. The varied pest situations encountered included insect, bird, and rodent pest situations. The use of sanitation and exclusion was not considered a long-term control option due to the time, personnel, and resources required to maintain pests below action thresholds. Without the use of selective and prescriptive chemical control agents within and around the schools, there was nothing to prevent or deter a pest(s) from entering the building nor the recruitment of additional pests to that site (i.e., ants).

### **IPM Plan 2**

Schools receiving IPM treatment plan 2 (Arthur F. Smith Junior High, Bastrop Intermediate, Blanton Elementary, Holly Ridge Elementary, Janowski Elementary, and North Elementary) were limited to sanitation, exclusion, and some use of bait (e.g., insect, rodent) products. The IPM treatment plan failed to maintain pest levels below the established threshold limits in all schools. As with the other schools in this project, the pest problems varied from location to location. The limited use of bait products, in addition to sanitation and exclusion, did not significantly increase the overall effectiveness of the program. Before the conclusion of the study, all of the schools were switched to IPM treatment plan 3. As seen in the schools initially treated using



IPM treatment option 1, the personnel, time, and resources to maintain the schools in a reasonably pest-free environment were greater than normal school budgets would allow. Even when treated by a professional pest management professional, the limits placed on their control options precluded them from adequately addressing the pest problems encountered.

### **IPM Plan 3**

The schools treated with IPM treatment plan 3 (Bastrop Middle School, Lyons Elementary, Murry Fly Elementary, Opelousas Junior High, Peabody Magnet School, and Rayville High School) utilized sanitation, exclusion, bait application, and a limited and prescriptive use of pesticide and rodenticide products. The use and selection of the control product was based on the information gained from the site inspections and the glue board monitoring. Thus personnel were able to target applications and control tactics towards each pest or infestation encountered. By combining a strong offensive control program (perimeter pest control application) with an equally strong and defensive interior pest control program, grounded in the use of sanitation and exclusion as a first step, pest problems were easily managed. If at any time a pest population increased above the accepted threshold level, a quick and appropriate response was applied. By the end of this project all schools were using IPM treatment plan 3 to manage their pest problems.

The goal of any integrated pest management program within a public school system is to control a pest infestation(s) while ensuring the protection of the health and welfare of the children and personnel attending those schools. Results from this IPM Demonstration Project provide evidence that undue limitations on the use of pesticides within public school systems places at risk the health and welfare of the children, staff, and structures from pests.

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